بسم الله الرحمن الرحيم

"واتقوا الله ويعلمكم الله"

★ Blood ★

Minds family

Creative learning

حصة ١٣ hemostasis

★ Fibren is formed of 4 poly peptide chain.. it is soluble

★ Fibrinogen is formed of 6 poly peptide chains .. it is insoluble

➡ To transfer insoluble fibrinogen to soluble fibren we need thrombin "it's protein

➡ Thrombin is found in an inactive state called prothrombin and it's clotting factor 2

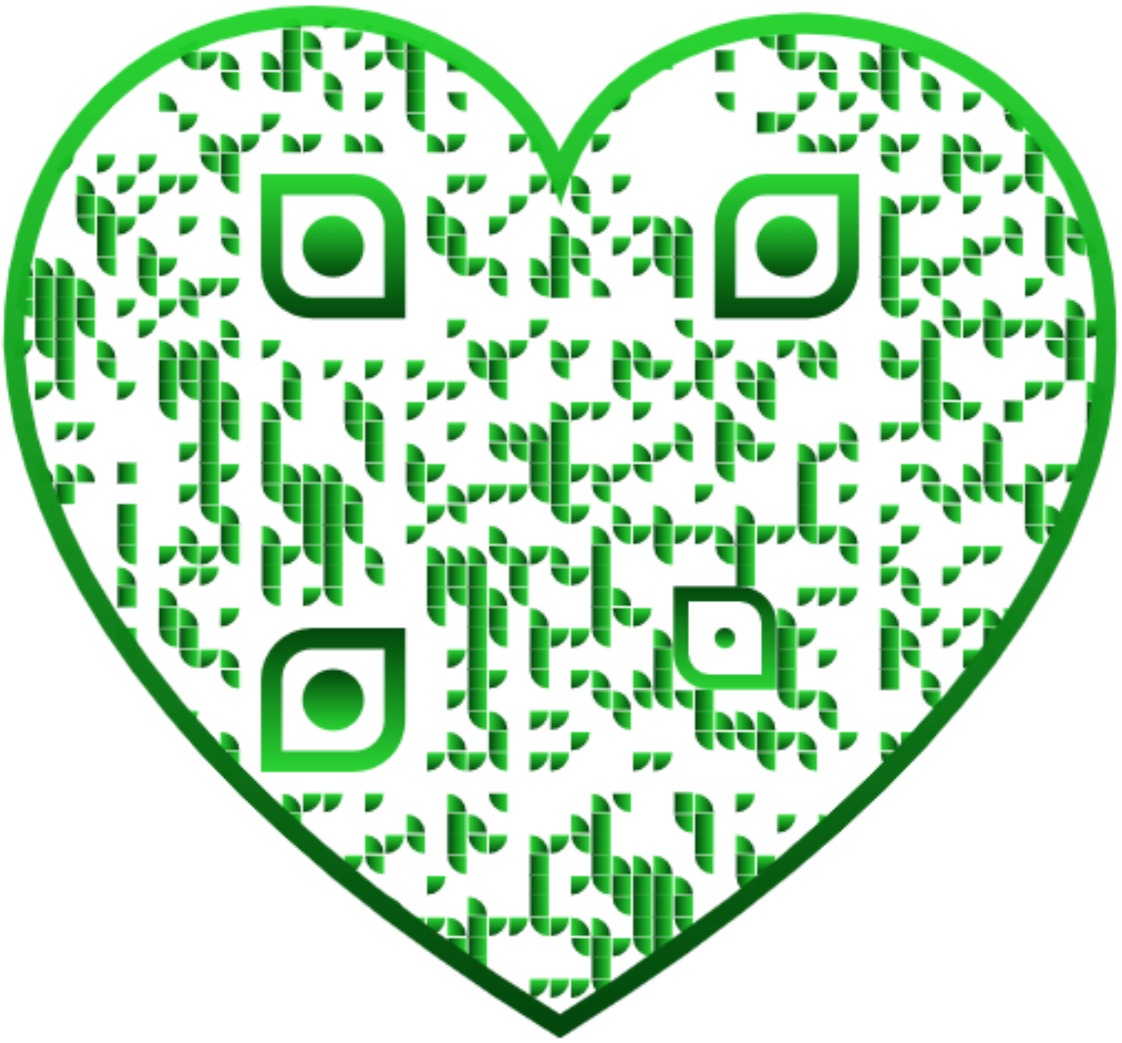
★ It's found in an inactive state to prevent wrong clots in blood

واحد من كل ثلاثة يحدث لهم جلطة خاطئة فى القلب..

Mechanism :

1-Thrombin enzyme break 4 poly peptide chains from fibrinogen to transfer it to fibren.

2-Thw other 2 poly peptide chains of fibrinogen cause vaso constriction.



To transfer prothrombin to thrombin we need "prothrombin activator complex"

It's complex formed of 4 components to prevent wrong activation.

The 4 components are :

1-factor 10 .. the most important

2-factor 5

3-calcium ions "Ca"

4-platelet phospholipid "platelet factor3"

How to activate factor 10?!

By 2 ways:

1-by factor 7

2- by factor 8

1-By factor7 extrinsic path way

عشان ٧ ينشط ١٠ محتاج حاجة من الـ

tissue عشان يتأكد إن فيه إصابة

Factor 7 is the most important in the extrinsic pathway.

Tissue thromboplastin activate factor 7

Then factor 7 activate factor 10.

2-":by factor 8 "intrinsic pathway

Collagen fiber appears if there's trauma or injury

Collagen activate factor 12

F12 activate F11

F11 activate F9

F9 activate F8

So, F8 activate F10

The formed fibren is loose

So, F13 is used to transfer loose fibren to solid fibren

So, F13 is called "fibren stabilizing factor.

برا الجسم .. الدم بيتجلط عن طريق ال:-

Collagen fiber لوجود intrinsic pathway

لكن مش بيتجلط عن طريق ال:-

Tissue لان مفيش extrinsic

What are clotting factors?!

They are plasma proteins globulins"

They are formed in liver except F8

F8 is formed in platelet and blood vessels.

Functionally: تبعا للوظيفة

Prothrombin is a protiolytic enzyme

بيكسر(polypeptide chain) بينشط بالتكسير

F1_ fibrinogen

F2_ prothrombin

F13_ fibren stabilizing factor

F6 .. has no rule in coagulation

So, clotting factors are 12 in number "the most important"

But in general, they are 50 factors

Rule of calcium in coagulation:

It must be ionized calcium

It help in all steps of coagulation except the first 2 steps of the intrinsic pathway.

So, it help all clotting factors except 12 and 11.

F11 and F12 are helped by HMW(high molecular weight kininogen)

Vitamin K is important for coagulation.

It's important in formation of factors 2,7,9,10 and protein C.

Coagulation occurs by tow pathways

1-Tissue factor initiate extrinsic pathway

2-F12 with exposed collagen initiate intrinsic pathway.

عملية التجلط عبارة عن cascade اى متوالية ومتزايدة

كل خطوة تتسبب فى حدوث الخطوة التالية ،، والخطوة التالية دائما اقوى من السابقة لها .

clotting factors

هنقسمهم مجموعات:-

1-fibrenogen group

الصانعة للجلطة

F5 – F8 – F13

They are activated by thrombin

…… serum don't contain fibrinogen group

As it's plasma without clot

بلازما منزوع منها الجلطة. والجلطة هى الfibrinogen group،

… F8 is formed of 2 parts:

1-F8 C , for coagulation ,, made in liver,, need F8 antigen to be activated and do its work

2-F8 antigen

لانه ملوش منشط تانى F8 من غيره ميشتغلش .

Hemostasis حصة ١٢

Vitamin K work as co-enzyme

F7,9,10 formed in liver with the help of vitamin K

Prothrombin "F2" share in formation of clot

But, prothrombin group help in formation of clot

تساعد ولا تتدخل

2-contact group:

Contain F11 and F12

3-prothrompin group:

Contain..

1.F2 "prothrombin"

2.F7

3.F9

4.F10

… specific factor for intrinsic pathway :

F8 , F9 , F11, F12

… specific factor for extrinsic pathway:

F7

إيه الضمانات ال عملها ربنا عشان يمنع الجلطة الخاطئة؟!

3 general and 3 specific

First , general::

1-liver:

صانع الشئ هو القادر على تصريفه

Liver make all clotting factors

If one of them become activated , the liver will deactivate it to prevent clot.

2-smooth endothelium that cover collagen

As collagen fiber activate F12

Smooth endothelium prevent intrinsic pathway.

3-heparin

زى عبد السلام النابولسى .. مش بياخد بطولة لكن بيساعد البطل

Second, specific::

1-prostaglandins"prostacyclin":

All prostaglandins in the body are made of arachidonic acid.

Arachidonic acid also produce thromboxane A2 that share in hemostasis.

Prostacyclin are produced by endothelium.. presence of endothelium mean that we don't need clots .so, Prostacyclin is produced.

Thromboxane A2 هو أهم ما فى الhemostasis

Thromboxane A2 , directly, cause vaso constriction and indirectly, cause platelet aggregation.

Prostacyclin produce cAMP that prevent platelet aggregation.

لو نقص F7 مش هيكون فيه مشكلة كبيرة "

ولو نقص اى فاكتور من بتوع Intrinsic factor هيؤدى للإصابة ب hemophilia

2-anti-thrombin 3 :

اسم على غير مسمى ،، يعنى لو قال انه بيوقف عمل ال Thrombin يبقى غلط

It bind to F9,10,11,12 and block their activity.

It's activated by heparin.

3-fibrenolytic system:

لو حصل جلطة بعد كل دا بييجى دوره

It's formed of :

1.enzyme "inactive plasminogen"

بينشط لما الجلطة تتكون

2.the activator of the enzyme.

plasminogene بيتنشط عن طريق TPA ويتحول plasmine

اسمه Plasmine عشان موجود فى ال بلازما

اسمه fibrinolysine عشان بيحطم ويدوب الجلطة

TPA: tissue plasminogene activator.

لو حد جاله جلطة فى القلب او المخ وروديته للمستشفى قبل مرور ٦ ساعات واديته حقنة من TPA

هتذوب الجلطة وكان شيئا لم يكن.

Presence of endothelium prevent hemostasis

Endothelium produce thrombomodulin

that bind to thrombin and form complex

that activate protein C and protein S to remove the inhibitor of TPA

, so, plasminogene is transformed to plasmin.

thromboduline هيتحد مع ال thrombin اللى بيكون الجلطة عشان يكون مادة مذيبة للجلطة كدا كونا مادة تمنع الجلطة وفى نفس الوقت قللت المادة ال بتكون الجلطة.

Protein C and protein S also, inactivate F5 and F8 as they are part of fibrinogen group.

How to prevent coagulation in vitro?!

خارج الجسم كمعمل التحاليل

1-precipitation of calcium ions by citrate or oxalate.

2-heparin that activate anti-thrombin3.

3-siliconized containers.